Sempra Energy
Southern California Gas Company

Natural Gas Modeling Approach, Methodology and Tools

Docket 04-IEP-01 –D. Electricity and Natural Gas Forecast and Options

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BACKGROUND INFORMATION AND KEY QUESTIONS

1. General Modeling Questions

- **a) What are the market characteristics to be included in the short-term and long-term modeling exercises?**
- ***Response a):***
  - Natural gas markets in California will continue to be split into Core and Non-core categories.
    - **Core customers** - wide short-term swings in their consumption tied to weather as measured by monthly heating degree-days.
    - Long-term consumption driven by population growth, housing construction, and energy efficiency efforts.
    - **Larger Commercial and Industrial customers** influenced more by gas prices, growth or decline in economic activity, energy efficiency efforts, and trends in manufacturing versus services.
    - **Gas-fired electricity production** is highly variable in the short-term, depending on weather and hydro conditions.
    - Long-term use of natural gas for electricity production will depend on electricity demand growth, energy efficiency, and state policies impacting the type and location of electric generation to be built in the future.
    - **Nationally, demand for natural gas has been largely driven by gas used for electricity production.**
    - Modeling should incorporate alternate fuels prices, environmental externality costs, and national policies on electric production.

General Modeling Questions, continued …

- **b) What are the major issues to be addressed in modeling the infrastructure, supply, and price trends?**
- ***Response b) :***
  - **The potential for liquid natural gas (LNG) facilities** to affect the amount of gas and the way gas flows are important considerations in California and nationally.
    - LNG brought in on the West Coast will affect the California gas infrastructure.
    - On the national level, LNG will also be a major factor. Markets seem to be more integrated nationally with pipelines to the East from Western Canada and the Rockies.
    - Analysis of the national pipeline infrastructure and needed infrastructure changes to integrate prices with different LNG entry points could also be important.
  - **In electricity markets**, the extent to which **transmission constraints** are not addressed by California and the extent to which **generation is distributed** toward locations where consumption takes place will have effects on the amount of natural gas used for electric production and the California gas infrastructure.
  - **California policies for diversity of supply sources for electricity** customers (**renewables**) and core gas customers could also impact the gas infrastructure.

General Modeling Questions, continued …

- **c) How should a base case or a reference case be used in the market analysis?**
- ***Response c):***
  - **A "base" or reference case should be designed to reflect the key current characteristics of gas and electricity markets in California**, including assumptions that can be viewed as non-controversial.
  - It should also reflect assumptions about the future that incorporate policies and contractual commitments already in place. For example:
    - **Construction of an LNG re-gasification plant in Baja California, Mexico is already in process and should be part of a "base" case.**
    - **The commitment to CPUC-mandated energy efficiency investments funded by customers should also be included.**

General Modeling Questions, continued …

- **d) How should the scenarios and sensitivities be designed to capture current and future market issues? Are there alternative approaches?**
- ***Response d):***
  - First, a well-defined set of sensitivity simulations should be executed to determine the sensitivity of model results.
  - Second, construct meaningful scenarios from internally consistent assumptions.
  - Rather than view the sensitivities and scenarios as a set of predictions of the future, their results should be viewed as information about how gas and electricity markets in California can be expected to respond to "stress."

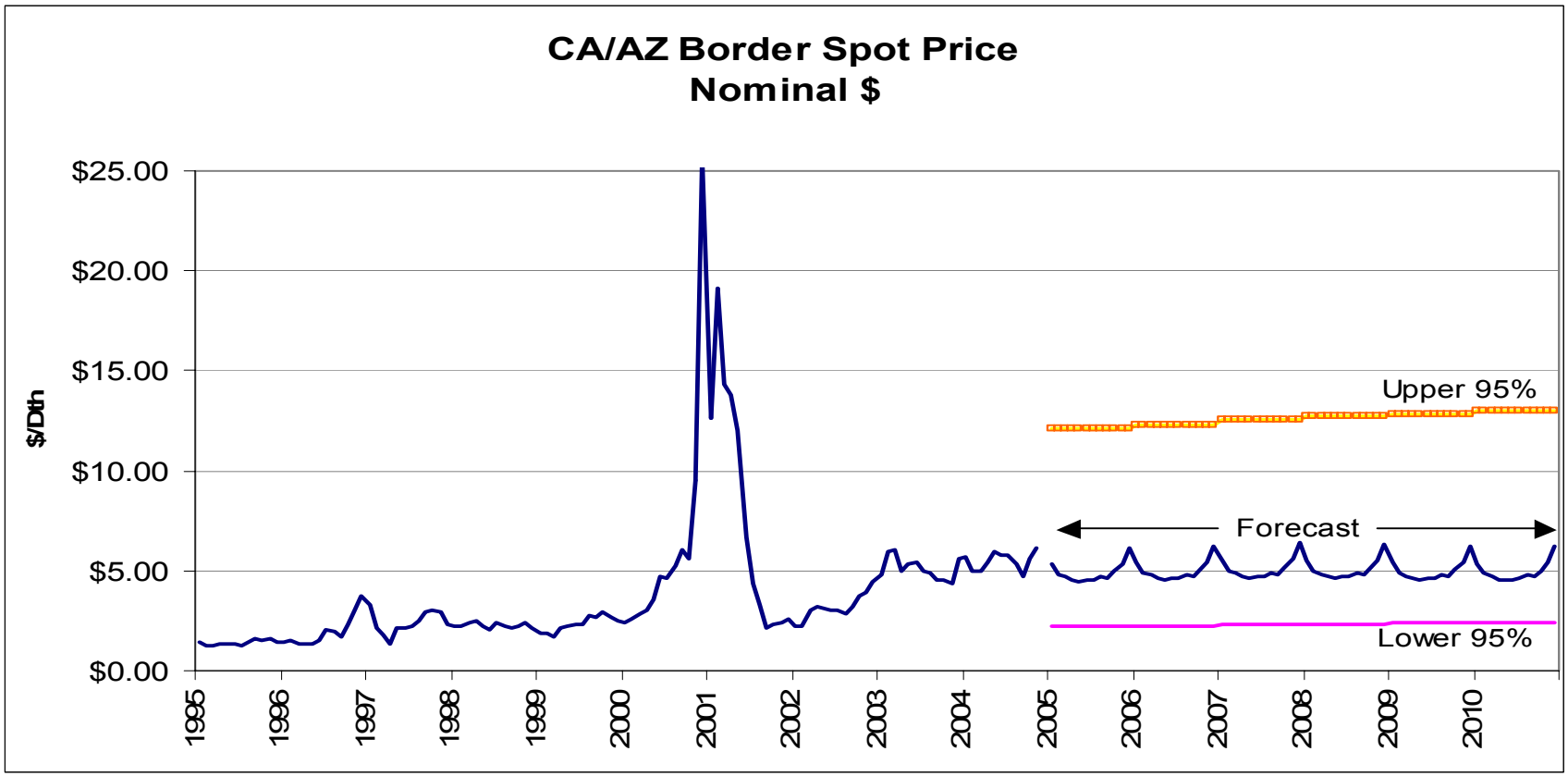
2. Pricing Issues continued … . What is the best methodological approach for developing a reasonable forecast? How should these approaches best be modeled?

- **a) Should the model forecast a "market fundamental" price, or focus on a spot or forward market price? b) What is the relationship between futures projections, spot prices, and prices projected by modeling exercises?**
- ***Response a and b) :***
  - **For a long-term forecast, a full modeling of the national energy markets is required fully incorporating fuel substitution.**
  - **We recommend using a consensus approach** to the long-term price forecast, which would rely on other experts in private firms such as CERA (Cambridge Energy Research Associates), or PIRA (Petroleum Industry Research Association), and public agencies such as the US EIA or Canada's National Energy Board (NEB)--as proposed in the CPUC's Renewable Portfolio Standard (RPS) proceeding.
  - **Short-term reliance on 60-day averages of forward markets for 2-3 years with transition to the long term forecast based on fundamentals as proposed in the CPUC RPS proceeding or the CPUC Avoided Cost proceeding is appropriate to incorporate into the forecast.**

2. Pricing Issues, continued … What is the best methodological approach for developing a reasonable forecast? How should these approaches best be modeled?

- **b) continued. What are the factors to be reconciled with such analytical procedures?**
- ***Response b continued:***
  - **Long-term forecasts should rely on models that are driven by "market fundamentals" of national supply and demand forecasts.**
    - Forward market prices can be useful as an indicator for short-term market fluctuations.
    - Since the CEC's gas price forecasts are used for long-term forecasts, we recommend placing less emphasis on futures prices, or using them for short-term forecasts and then transitioning to the fundamentals forecast as described above.
    - For forecasts more than 2-3 years out, futures markets are fairly illiquid and should not be relied on.
  - **Futures contracts tend to have a cyclical seasonal pattern similar to model-generated price projections.**
    - Currently the two methodologies are tending to concur in their projections, even in the longer run; futures prices further out are trending download toward the $4 to $5 price range projected by "fundamental driven" models.
    - **However, because of futures' illiquidity more than 2-3 years out, futures prices' advantages are best limited to short-term forecasts.**

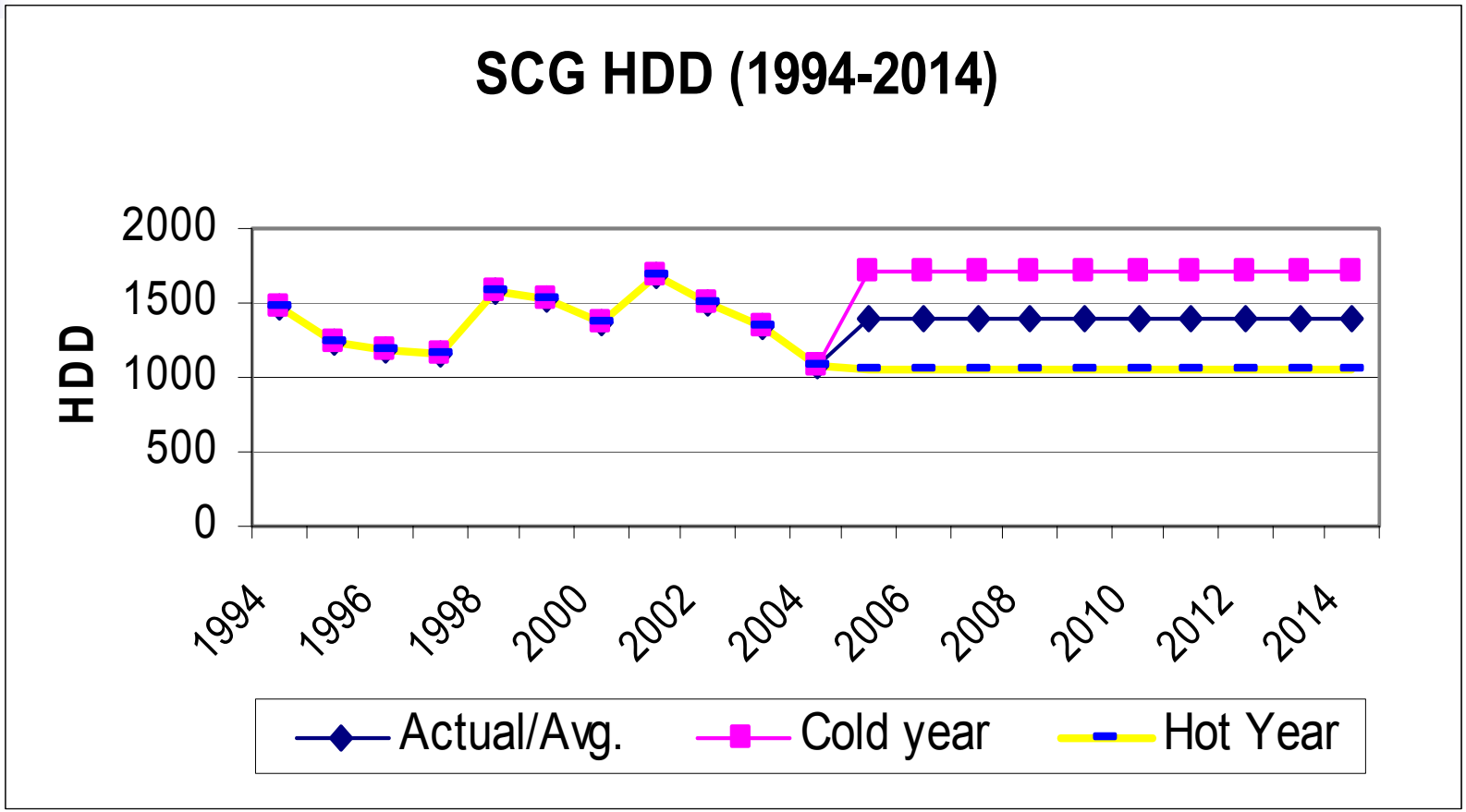
Gas price forecast used in LTRP, based on weighting of independent forecasting firms' projections.



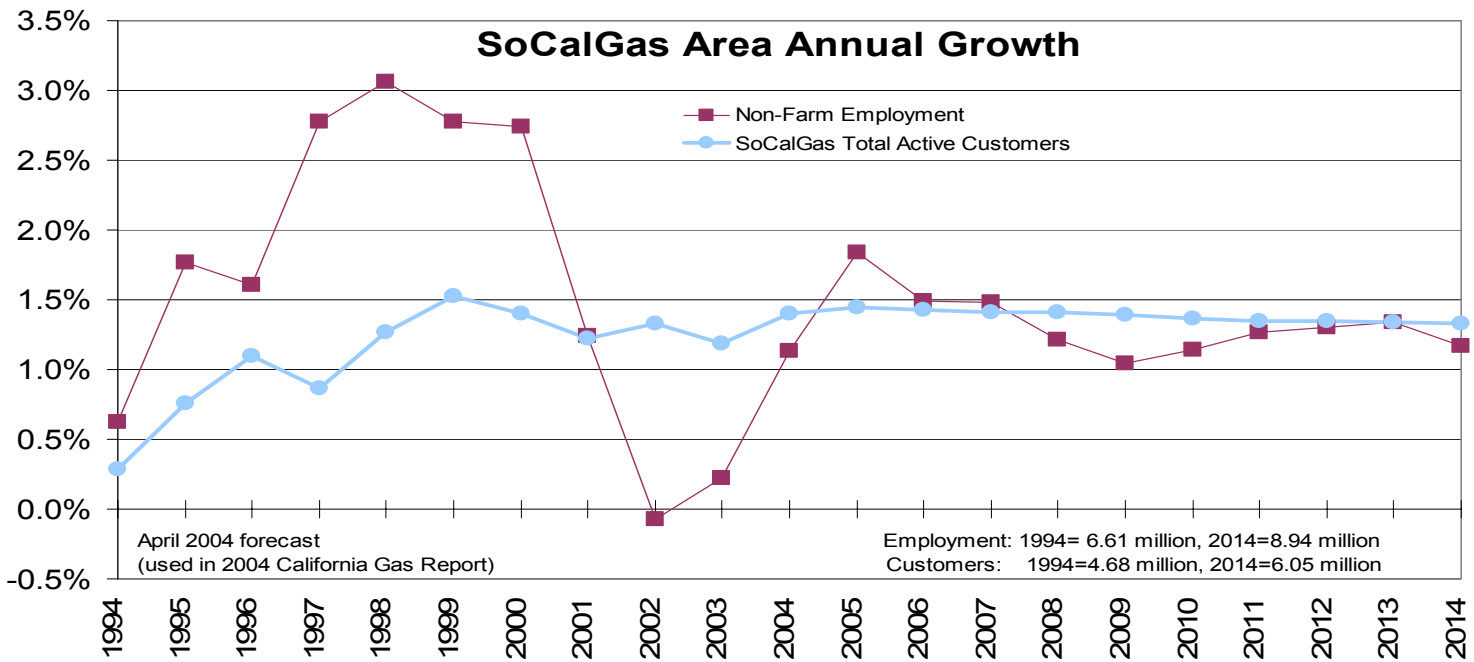
3. Demand Projections

- **a) What are the issues to be considered in analyzing demand trends and projections?**
- ***Response a):***
  - **Consider factors that affect the demand trend in California**.
    - **For the short term** they are weather (heating degree days and/or cooling degree days); demographic and economic factors (i.e., household growth, employment, consumer price index); active customer meters; and fuel prices
    - **For the long term**, CPUC mandated (2006 – 2013) energy demand reduction goals and budgets for investor-owned utilities in California.
    - US immigration policies could significantly impact California's population growth and corresponding gas demand.
    - Air Quality Management Districts' (AQMDs') policies that prohibit or restrict alternate.
    - State electric renewables mandates reduce demand for gas-fired electric generation (EG).
    - Other long-term policies include potential State-legislated CO2 restrictions, and State electric transmission policies that could affect the location and type of fuel used for electricity production.

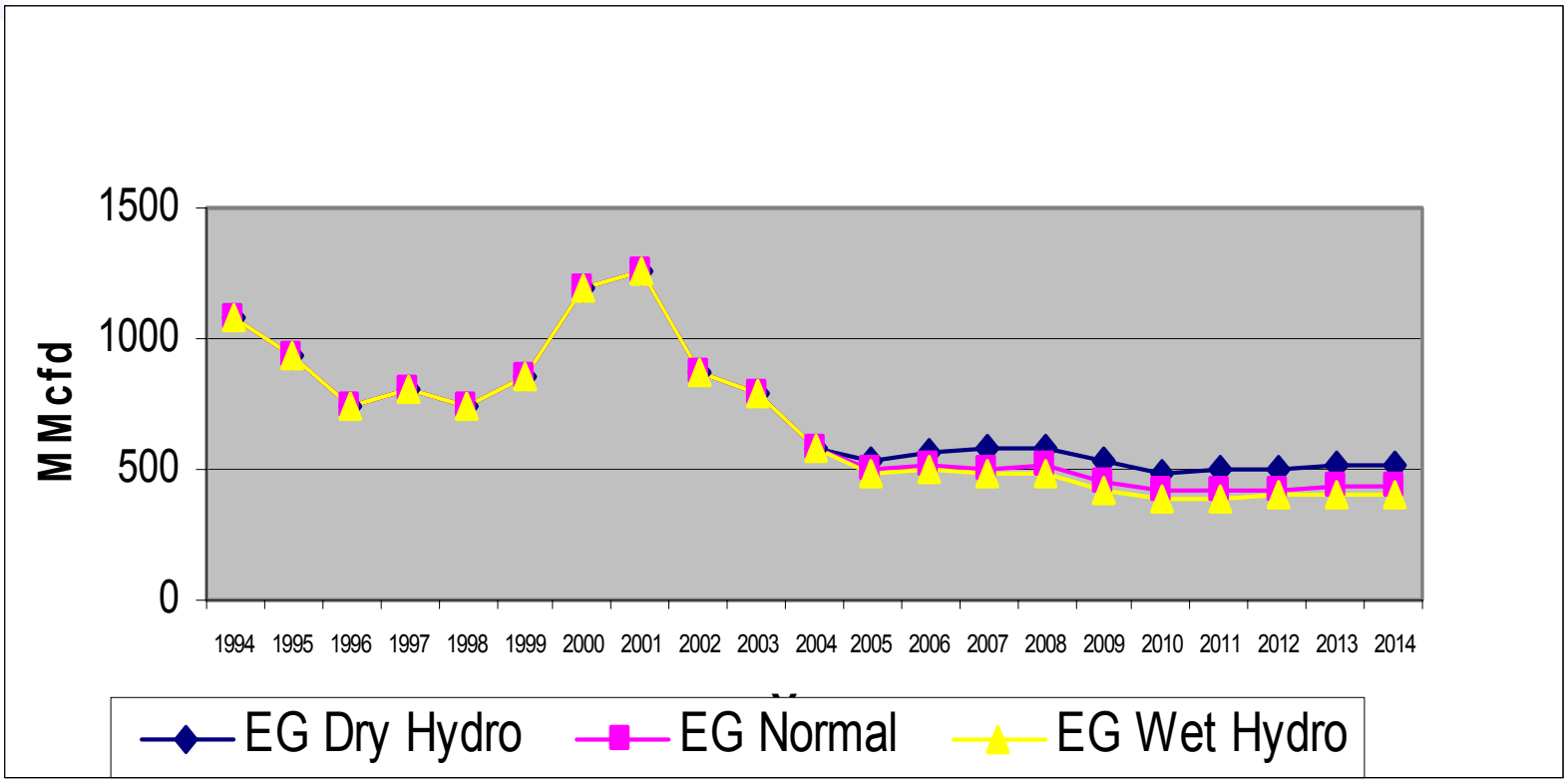
Actual and Forecasted HDD in SCG's Service Territory



Gas demand drivers for residential and commercial and industrial customers.



SCG Electric Generation Gas Demand in MMcfd (1994-2014)



3. Demand Projections, continued …

- **b) What is the desired way to approach demand assumptions? How should the elasticity be estimated? To what level should competition and switching of natural gas with other fuels be considered in long-term and short-term analysis?**
- ***Response b):***
  - To approach demand assumptions, we recommend developing standard economic models/methodologies to derive the non-policy demand input assumptions.
  - The price elasticity can be estimated through econometric modeling by regressing the historical gas throughput for a customer class on gas rate, controlling for other important factors.
  - The elasticity for gas demand for electricity production is in large part a policy variable depending on the extent to which the CPUC, CEC and the legislature allow retail customers to see the marginal electric generation price.
  - Long-term fuel switching is also a policy variable related to CARB, air quality districts, and CPUC and CEC policies on electric generation and industrial fuel switching.

5. Miscellaneous Issues:

- **a) Is there any modeling issue not included in the above list?**
- ***Response a)**:*
  - a) In any supply forecasting beyond 2006, the CEC should examine various scenarios and make clear, specific assumptions regarding liquid natural gas (LNG) supplies (both timing and volumes) coming into California and Baja California, Mexico.
  - Long term forecasting should also take into account planned interstate pipeline expansions and assumptions about future interstate pipeline expansions—and their impacts on gas flows into California and access to North American supply basins.
- **b) Should (and if so, how should) the natural gas market analysis include modeling of criteria and/or non-criteria air emissions?**
- **Response b):**
  - Air emissions should play a role in natural gas forecasting, insofar as California's various AQMD's restrict competing fuels (oil, coal, etc.) based on their emissions – and thereby tend to increase in-State gas demand for gas-fired electric generation (EG).
  - Assumptions about California and national policy on CO2 emissions would be speculative and premature at this point in time.

Miscellaneous Issues, continued:

- **c) How should the natural gas analysis be integrated with other energy sector analysis?**
- ***Response c):***
  - Electricity sector:
    - Tie gas demand for electricity generation to electric supply and demand.
    - In California, gas-fired EG functions as the "on-the-margin" supply source to meet swings in electric demand. As such, gas-fired EG—and its corresponding natural gas demand—can swing widely if there are significant changes in electricity demand (i.e., hot summer weather) and/or electricity supplies normally driven by other fuels (i.e., hydroelectric—dry hydro year increases EG and EG's gas demand; temporary nuclear shutdowns can increase EG and EG's gas demand).
    - Mandated electric supplies from renewable sources (hydro, wind, solar…) –and any future State changes in the levels of those renewables mandates—will also affect EG-related gas demand, since more renewables-generated electricity could mean a corresponding drop in gas-fired EG.
    - Likewise, policy on electric transmission expansion impacts the location and type of EG and the resulting gas demand.
  - Alternative-fuel vehicles: More peripherally than EG--gas demand in natural gas vehicles (NGVs) could be integrated with analyses of the markets for gasoline-electric hybrids and eventually hydrogen-powered vehicles.

Miscellaneous Issues, continued:

- **d) If the Energy Commission does not rely on an internal forecast, which other forecast should it rely upon?**
- ***Response d):***
  - If the CEC does not do its own forecast for California, we recommend using aggregated forecasts from California's natural gas utilities (along the lines of the ***California Gas Report***).

  - If the CEC does not do its own forecast for national gas demand and supply and the resulting price, we recommend using a weighted average of other private and public forecasts as described in Response (2a) above. Such as: CERA (Cambridge Energy Research Associates), or PIRA (Petroleum Industry Research Association), and public agencies such as the US EIA or Canada's National Energy Board (NEB)--as proposed in the CPUC's Renewable Portfolio Standard (RPS) proceeding.